The Magic Sock Drawer Project

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Abstract
In this paper we describe the design of a intimate communication system, the Magic Sock Drawer. The system allows close friends to send drawn or typed digital notes to one another which are then automatically printed at the other end. The system allows us to investigate a number of design decisions that will have an impact on how communication systems create feelings of closeness between remote partners. The four design concepts explored include 1-to-1 communication, personalization, tangibility and location. We present the results of a 6-week pilot study using the system and the impact it has had on the study participants' relationship.

Keywords
Communication, Intimacy, Tangibility, Design Factors

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms
Design, Human Factors

Introduction
Technological systems, especially digital communication systems, increasingly pervade our lives. At the same time, lifestyle changes mean that there are a

substantial number of people who have to maintain long-distance relationships, be that with family, friends or lovers. These people have to maintain these relationships through these communication systems. However, current digital communication systems were designed for business use. Our aim is to design a number of devices specifically to help maintain long distance relationships.

Short et al. [13] as long ago as 1972 argued that different communication technologies had an impact on the social presence of the relationship between participants. Although commonly misunderstood as suggesting that each communication medium has a certain level of social presence, it is now generally accepted that other factors are also involved. However, exactly what those factors are have not been well explained or investigated.

We are not the first to consider developing devices to help maintain long-distance relationships, even if we are more explicit in explaining this as our motivation. There are a large number of devices in this area, ranging from being extremely abstract, such as clicking a coloured circle in a desktop taskbar to change the colour of your partner's circle [6], through to the adding of concrete features to beds to replace a missing partner [2,5].

There are however two common issues running through much of this work. The first is an interdisciplinary issue which is a significant challenge for the field; how do we resolve the tension between design innovations and the generation of new models of evaluation. Too many exciting designs are developed but never taken forward to the evaluation stage. The second is that the focus has been on augmenting *artefacts* to create communication systems. We propose focusing on co-located *behaviour* and creating communication devices to mimic such behaviour at a distance. A few devices have been proposed, notably [3, 4, 10], which follow this paradigm. All of these systems consider hugging – there are clearly many more behaviours (hand-holding, kissing etc) which could be considered.

In this paper, we report on the design of a system to explore behaviour-oriented interactive technologies that are intended to foster social presence between people in close personal relationships. We first describe our design concept and then discuss our exploratory long-term study of its use.

The Magic Sock Drawer (MSD) system which we present here, focuses on the leaving of love notes as it's behavioural background.

Design Concept

The inspiration for the MSD system comes from three main places. The first is the behaviour of leaving notes to a loved one, often in a personal or intimate location. This, along with aspects of playfulness has been investigated before (e.g. [8]). The second is the peek-a-drawer project, [12]. The communication system consisted of two bedside cabinets. Placing an object into one of the drawers causes a photo to be taken of it. This image is subsequently displayed on a LCD screen in the other drawer in the other cabinet. The third and final inspiration was the focus group reported in [16] where a participant reported that they "would hide messages in places their partners are likely to visit (e.g. underwear drawer). These gifts would be discovered later serendipitously".

The Magic Sock Drawer project is a communication system intended to reflect these ideas. The idea is to generate a small love note on a computer and "send" this to a partner where it is automatically printed out for them. The writer's partner would then find these notes serendipitously.

As an interesting comparison, the peek-a-drawer system, [12], took a physical artefact and turned it into a digital representation which was presented at the remote location. The MSD system takes a digital representation which is then turned into a physical artefact.

In addition to the device concept itself, there are four concepts wrapped into the design of the communication system: 1-to-1 communication, personalization, tangibility and location.

The first of these is the closed nature of the communication system. Many of those communication systems we use on a daily basis use a many-to-many design. This means that many people can contact you (and you can contact many people) using the same device. For example, anyone can email your email address (assuming they know what it is) and you can email anyone from the same address. With regards to research-based communication systems a distinction can be made. Some are clearly intended to be expanded to many-to-many systems; others are intended to be 1-to-1. We make clear to participants that only their partner can contact them using the MSD. This means that when they see a note, they instantly know that it has been sent by their partner and is exclusively for them.

The reason for doing this is to identify the experience of interacting with the other person with the use of the system. When you use the same phone to speak to your bank manager and your lover, there is no way of attaching significance to the phone as a means of intimate communication. We hope to challenge that assumption with the MSD. There is some social behaviour to support this – keeping a personal and business phone for example – but the focus is making this knowledge clear to the MSD users.

The second concerns the creation of the notes. One of the things investigated with the MSD is how changing the level of personalization of the notes affects how people feel about the system. Digital communication systems often remove all personalization – an IM from your parents looks the same as an IM from your school friends. This is something which people decry, attracting comment from newspaper columnists and social commentators who argue that "handwriting a letter is usually an act of love, which no one could ever say about typing" [7]. There are two things implicit in this argument which should be made explicit. The first is that receiving a letter which is handwritten rather than typed is more personal and therefore more intimate and thus is inherently preferable. The second, we argue, is that the amount of effort which is put into writing a letter (or the amount of effort which is perceived to have been put in) is valued. This is an argument which has been made before. Riche et al. report that when discussing digital vs. traditional communication participants preferred traditional methods as digital messages are "easier to create and less sensual. Participants explained finding a special value in the effort others made to create and send messages" [11].

Figure 1. The Magic Sock Drawer

Figure 2. A note being printed

The other major distinction between current digital systems and some traditional communication is the absence of tangibility. Again this is something that has been noted in the mainstream media – "a love email – or a love text – is never going to be the same as a pen-and-paper love letter of the kind you carry around with you until it disintegrates" [7].

There is no fundamental reason why digital systems cannot transmit handwritten messages, create messages which are tangible, or use messages which require effort to create. These are all things which the MSD system demonstrates.

The last factor the MSD makes explicit is the use of personalized location. By asking participants to place the MSD in a intimate location we can investigate whether associating the notes with this location has an impact on how the notes and system are regarded by it's users.

Implementation

The MSD system is implemented using two sets of equipment sharing a unique connection, each consisting of a tablet PC with a custom note-writing application and a mini credit-card sized printer (see Figures 1 and 2). Participants are informed of the unique connection, reinforcing the 1-to-1 nature of the communication system.

Notes can be generated using three different interfaces. The first of these (Figure 3) is a simple painting program. As the system uses a tablet PC, users can draw on the note using the tablet pen and then send the note. The second interface is text based and consists of entering text into a text box and then adding it to the note (Figure 4). The third interface is a hybrid of the first two: it looks like Figure 4 but in addition to the typed text, users can also draw on the note as in the drawing interface. The three interfaces were designed to investigate the impact of personalization on the perception of the notes and more generally of the system as a whole.

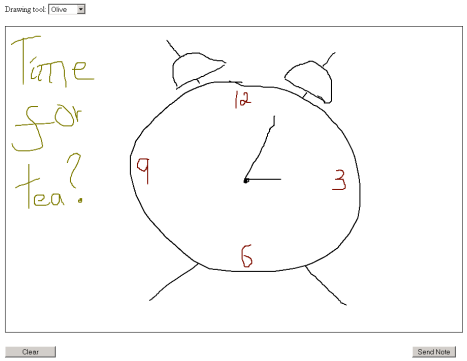

Figure 3. A note being made on the drawing interface

Once the note has been generated it is "sent" to the other person. This saves the image onto the local hard drive. A script is scheduled to run on each tablet every five minutes. This script copies any local notes onto the shared hard drive. The same script then checks the shared hard drive for any notes intended for this machine. If there are any, the notes are copied onto the local hard drive. The script then boots a Bluetooth exchange program to send the notes to the printer.

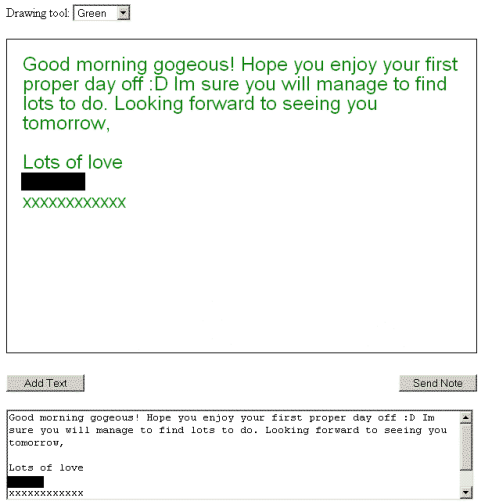

Figure 4. A note being made on the typed interface

Field Study

Having described the MSD as an implementation of certain design concepts, we now turn to our exploratory field study. We hoped to learn from the study whether the design decisions made were appreciated by potential users of the system.

The MSD system was installed for a pilot study for 6 weeks with an intimate couple living apart. Each interface was used for two weeks.

Participants were directly approached by us as they were known to be living apart having previously lived together. They were briefed about the system and what data we would be collecting. At no point were the participants briefed as to what kinds of notes they should send through the system.

The participants, who we shall call Dave and Tina, were a male/female intimate couple, living within the same city but in separate houses. Both were living in their respective family homes. In their early 20s, the couple have known one another for 7 years having been partners for 4 of those.

Participants were told that they could use the system however they like. They were informed that copies of all notes were being stored for analysis at the end of the study but would be treated in confidence.

Dave and Tina were asked to keep a daily diary during the study. Although completely free-form, participants were prompted to talk about the notes they'd sent/received and why, how the notes made them feel, how happy they felt about their relationship and whether they thought that using the Magic Sock Drawer was changing their relationship.

In addition to the free-form sections, the diaries also contained two measures – a measure of social presence from [13] and a measure of closeness from [1] – to see how the participants' relationship was changing over time. The measures were completed before the study began and then after using each interface for two weeks. Neither of the measures showed a significant change over the period of the study.

Finally, at the end of the study, both participants were interviewed about their use of the Magic Sock Drawer

system to investigate the couple's thoughts and feelings about the system over the whole 6 week period.

Results

In total, 28 notes were sent over the 6 week period. 20 of those were sent in the first 2 weeks (using the drawing interface), 6 were sent in the middle 2 weeks (using the text interface) and 2 in the last 2 weeks (using the combined interface). Figures 5 through 7 show examples of some of the notes sent.

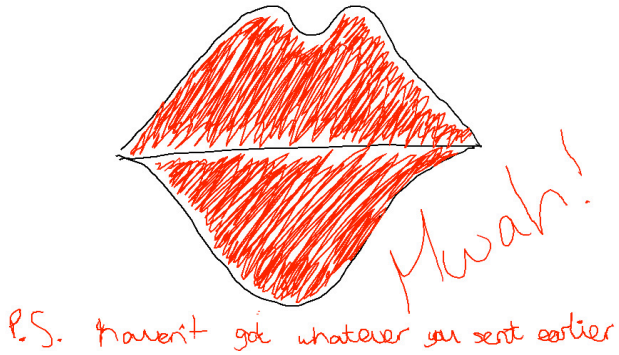

Figure 5. A picture note

Good morning gorgeous! Hope you enjoy your first proper day off :D Im sure you will manage to find lots to do. Looking forward to seeing you tomorrow,

Lots of love,
[redacted]
xxxxxxxxxx

Figure 6. A typed note

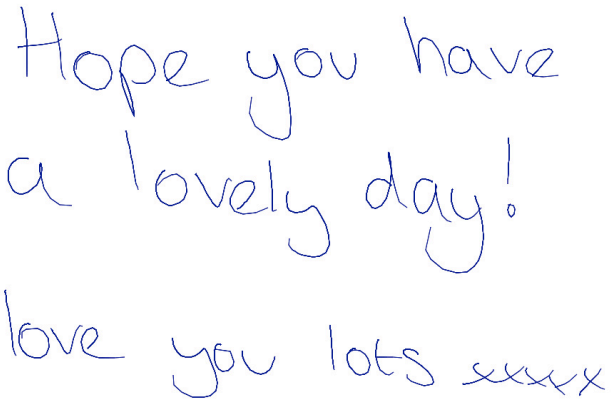

Figure 7. A handwritten note

Variations of Use
At first glance, this suggests a very strong novelty effect, that the system was used hugely during the initial period and that although there was a minimal level of interest beyond that point, participation dramatically dropped off.

However, this is not the case. The participants faced some major lifestyle changes during the experiment – including being made redundant and moving house – which dramatically changed their communication behaviour. As the diaries and interview made clear, the system was most used when the participants had not seen one another that day – something which was far more common before these life changes.

The other interpretation would be that the drawing interface was dramatically preferred over both the text and combined interfaces. The interviews made clear that drawing was preferred over text and it is possible that when the interface switched over to text only, participation dropped off so dramatically that it never recovered. As Tina said, "I enjoyed using it mostly when I could draw pictures".

Drawing
The drawing interface was liked for two main reasons. Firstly, the effort that creating a drawing was appreciated by the participants, with Dave saying "the feeling that someone's been thinking about you enough to kind of take some time out of their day to do it was good, it was nice". The second factor was that the drawing interface creates pictures that are fun, "someone's literally drawn you a little picture… and they're colourful which is always good" (Dave, interview).

Effort
The effort involved does have a negative consequence. As one of the participants wrote in their diary, on several days they did not have the time to use the system. This implies that if participants are busy, the system will not get used as it requires too much input from the user. Tina made it clear several times in her diary, "I did not have time to use the sock drawer".

Participants stated that the system was used in addition to their existing communication practices. This in itself indicates that there is value in the system rather than replicating things done by other communication tools. The ability to draw was highlighted as being different to other system by the participants who compared it to both SMS and email. The difference was in the content that was being communicated. SMS and email were used to communicate information or to ask quick questions, things the participants said that they wouldn't use the MSD for. The notes however were "either something nice and sentimental and emotional or humorous" (Dave, interview) – in other words, focused completely upon the relationship.

Using the MSD for just this content had an impact on the broader use of the system. The first was that although the drawings were good, it did limit what you can say through the system, e.g. "it's much harder to draw… a request or action" (Dave, interview).

Location
One of the other design factors we'd considered was the location of the printer. There were two main things that participants spoke about with regards to the location. The first was from Tina who had to spend a lot of time travelling during the study period. Using the

system was impossible whilst travelling and it was thus suggested that a mobile interface was introduced such that you could send notes on the go. Additionally the location of the system was not immediately obvious to her and thus she did not tend to use it as much as she wanted to.

Beyond that, the personal location was not considered to be that important beyond maintaining a level of privacy. Both participants lived in shared houses and thus said they would not have wanted the system anywhere else in the house and thought that the fact that no one else could use the system was more important than having the printer in a particular location.

The privacy issue is surprising but indicates that the notes were intensely personal. This is also supported by the fact that participants didn't show the notes to anyone else beyond explaining the system to interested people.

Tangibility

The other design decision was to create tangible notes using the printer. The fact that participants kept their notes, in a manner similarly to letters, indicates that tangibility was significant. Participants didn't stick any notes up but both stated that this was due to confusion over whether they were allowed to keep the notes due to the study. This is an issue that needs to be further investigated.

Closed Communication

The final design decision to discuss is that of the closed nature of the system, that participants knew that they could only send notes to one another, no one else could use the system. Tina explicitly said that they wouldn't have used the system with anyone else. Dave was less certain about it but would "still mainly use it for one-to-one communication with Tina".

Study Limitations

We must first acknowledge that the participant size in this exploratory study was extremely small. Additionally, the participants were not truly a long-distance couple as they lived in the same city. However, given the richness of the data gathered, we argue that we can still learn things from the study.

We also acknowledge that we did not collect data before or after the installation; this is something we intend to do when the project moves beyond the pilot study stage.

In methodological terms, there was a small issue. Ethically, participants had to be told that copies of the notes were being recorded. This was done as the notes are a good source of information for the study. However, the monitoring of the notes sent did have an impact on what notes were sent through the system with the suggestion that some more explicit content may have been sent. It is not clear how this issue could be resolved without losing the information about the notes.

Having discussed the impact of the various design decisions, we must now consider what impact the system had on the participant's relationship. The general feeling was that the system didn't have an impact on any "massive, deep level" (Tina, interview) but that in the short term they had a positive impact. Each note was "emotionally engaging, but not at a

superficial but at a contact level" (Dave, interview). No negative messages were sent through the system, as Dave said "I just hadn't thought that I wasn't sending bad messages if you see what I mean… I can text and say I've had a really bad day". This is also indicative that the system was reserved for sending `nice' things, to generate positive feelings. Further investigation is needed to see if these positive messages do or don't have a longer-term impact on the relationship as a whole.

The use of the system was not entirely positive. When notes were not received, this caused negative feelings. As Dave said: "I was actually quite sad I didn't get any, verging on quite annoyed". This is understandable in terms of gift giving. The sending of a note can be construed as giving a gift. As such, there is an expectation – as [9] and [14] argue – that a reciprocal gift will be made, in this case sending a note back. Some systems have even tried to take advantage of this phenomenon (e.g. [15]).

Given the varying social issues that were encountered during the 6 weeks, it is difficult for the participants to accurately predict whether they would miss having the system or not. Immediately after the installation, both participants agreed that they would miss it – "I think I would miss receiving them" (Tina), "I think I'd probably miss it" (Dave). Asked four weeks after the trial, Tina stated "I miss the drawing bit, definitely. Probably not the text bit though" and Dave said "yes I do. I liked drawing personal messages and miss the surprise of having one when I get home".

Conclusions and Further Work

There are two main conclusions from this pilot study. The first is pragmatic and mundane but no less important because of it: the Magic Sock Drawer system worked, participants used it and found value in using it. This value was expressed as appreciating the notes sent and as desiring notes to be sent.

The second finding is perhaps of more interest. At the start of this paper, we discussed several design factors which were taken into account when creating the MSD system. These factors are intended to be the bedrock of a design space, currently work in progress, exploring the decisions that need to be considered when creating systems for intimate communication.

The exploratory study lends support to several of the factors that were embedded in our design. Tangibility, personalization, 1-to-1 communication and effort were all appreciated. Others, such as location, were not as significant as we had considered in this instance.

However, this highlights the necessity of gathering the opinions of further participants to better gauge the importance of these factors to different people and to look for underlying similarities.

As Dave said "I might replicate [the MSD system] in some way" it's clear that this is a communication system which was valued and worth investigating further.

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